CITY COUNCIL

CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII

No. **11-347, CD1**

RESOLUTION

PROVIDING FOR THE APPROVAL OF THE MULTI-HAZARD PRE-DISASTER MITIGATION PLAN FOR THE CITY AND COUNTY OF HONOLULU UNDER THE PROVISIONS OF THE ROBERT T. STAFFORD DISASTER RELIEF AND EMERGENCY ASSISTANCE ACT, AS AMENDED BY THE DISASTER MITIGATION ACT OF 2000.

WHEREAS, 44 CFR Part 201.6, Local Mitigation Plans, establishes criteria for local hazard mitigation planning authorized by §322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by §104 of the Disaster Mitigation Act of 2000; and

WHEREAS, the Act specifies that after November 1, 2003, local governments seeking Pre-Disaster Mitigation (PDM) funds through a State application must have an approved local mitigation plan prior to the approval of local mitigation project grants; plan development is key to maintaining eligibility for future mitigation and disaster recovery funding; and

WHEREAS, federal requirement §201.6(c)(5) specifies that this approval must have "documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan"; and

WHEREAS, the City Department of Emergency Management has been designated as the agent responsible for the preparation of plans and programs for hazard mitigation and disaster emergency management for the City and has secured mitigation grants on behalf of the City in the past; now, therefore,

BE IT RESOLVED by the Council of the City and County of Honolulu that the Multi-Hazard Pre-Disaster Mitigation Plan for the City and County of Honolulu, as updated in 2010, as described in the Executive Summary attached hereto as "Exhibit A," and which by reference is made a part thereof, be approved; and

BE IT FURTHER RESOLVED that this plan be in compliance with applicable federal and state statutes, rules and regulations; and

BE IT FURTHER RESOLVED that City departments coordinate with the City Department of Emergency Management to incorporate natural hazard mitigation into existing planning efforts required by City Charter, including the General Plan and the Development/Sustainable Communities Plans, using the information given within the Multi-Hazard Pre-Disaster Mitigation Plan; and

RESOLUTION

BE IT FURTHER RESOLVED that City departments coordinate with the City Department of Emergency Management to incorporate future planning mechanisms to ensure this plan is maintained and updated using the systematic procedures given in the Multi-Hazard Pre-Disaster Mitigation Plan; and

BE IT FINALLY RESOLVED that the Clerk is hereby directed to transmit copies of this Resolution to the Mayor and the Director of Emergency Management.

INTRODUCED BY:

Ernest Martin (BR)

DATE OF INTRODUCTION:

November 29, 2011
Honolulu, Hawaii

Councilmembers

EXECUTIVE SUMMARY

The Purpose of Hazard Mitigation

The purpose of this multi-hazard mitigation plan is to provide a strategy to reduce or eliminate loss of property or life caused by natural hazard events for the City and County of Honolulu. A multi-hazard strategy presented in this plan addresses the relationship among various types of hazards, identifies actions that benefit multiple hazards, and prioritizes resources to areas susceptible to most severe or most frequent hazards.

The amount of damage during major disasters as a consequence of different natural hazards in the State of Hawaii is tending to rise as evidenced by the cost of recent disasters. Hazard mitigation is about making an investment and taking actions to permanently reduce or eliminate long-term risk to people and curb the costs of disaster impacts. Therefore the purpose of multi-hazard mitigation is twofold:

1) to protect people and structures from harm and destruction; and
2) to minimize the costs of disaster response and recovery.

Hazard Mitigation Planning and Plan Development

Hazard mitigation planning is the process that analyzes a community's risk from natural hazards, coordinates available resources, and implements actions to reduce risks. Since November 1, 2003, local governments seeking Pre-Disaster Mitigation (PDM) funds through a State application must have an approved local mitigation plan prior to the approval of local mitigation project grants. Since November 1, 2004, States must also have an approved Standard State mitigation plan in order to receive PDM funds for State or local mitigation projects. The Standard State Mitigation Plan will also be required for non-emergency assistance provided, including Public Assistance restoration of damaged facilities and Hazard Mitigation Grant Program funding. A State with a FEMA-approved Enhanced State mitigation plan at the time of a disaster declaration is eligible to receive increased funds under the Hazard Mitigation Grant Program, based on 20 percent of the total estimated eligible Stafford Act assistance. Therefore, State and local multi-hazard mitigation plans is key to maintaining eligibility for future FEMA mitigation and disaster recovery funding. County plans must be updated every five years to continuously maintain funding eligibility.

The development of the Pre-Disaster Hazard Mitigation Plan for Honolulu involved a significant broad-based participation of the Mayor, the City Council, Department of Emergency Management, the City & County Dept. of Planning & Permitting, the Oahu Hazard Mitigation Planning Committee and its public and private partners, many State agencies, such as State Civil Defense, the Dept. of Land and Natural Resources, the Dept. of Transportation, the State Hazard Mitigation Forum, HECO (electric utility) and federal partners such as the FEMA Pacific Area Office, NOAA and USGS.

Land Use Planning and Development in the City & County of Honolulu

The City and County of Honolulu guides and directs land use and growth through a three-tier system of objectives, policies, planning principles, guidelines and regulations. The General Plan forms the first tier of this system, consisting primarily of statements of objectives and policies. The second tier of the system is formed by the Development Plans or Sustainable Communities Plans, depending whether growth is planned for the region. These plans address eight geographic regions of the island: the Primary Urban Center, Central Oahu, Ewa, Waianae, North Shore, Koolauloa, Koolaupoko and East Honolulu. The third tier of the system is composed of the implementing ordinances, including the Land Use Ordinance (Honolulu's zoning code) and the City's Capital Improvement Program. Mandated by the City Charter, these ordinances constitute the principal means for implementing the City's plans. The tiers are supplemented with functional plans for the countywide water and wastewater systems and transportation.

Identifying and Profiling Hazard Events

Hazards are physical conditions or events that have the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of losses. The intent of this document is to present the current state of knowledge of natural hazards significant within the City & County of Honolulu. Hazards assessed in this plan include:

Strong Winds (Non tropical cyclonic)	Chapter 4
Tropical Cyclones (including Hurricanes)	Chapter 5
Landslides and Rock Falls	Chapter 6
Earthquakes	Chapter 7
VOG (Volcanic Gases)	Chapter 8
Tsunamis	Chapter 9
Floods	Chapter 10
Dam Failures	Chapter 11
High Surf/Waves	Chapter 12
Coastal Erosion	Chapter 13
Droughts	Chapter 14
Wildfire	Chapter 15
Hazardous Materials	Chapter 16

Detailed information is given in these chapters on previous occurrences of natural hazard events and analysis of probable future losses where possible. A very brief synopsis of each follows:

Strong Winds

Most wind storms are either from trade winds, which blow 70% of the time, or Kona winds (30% of the time). Tradewinds predominate from the northeast and generally range from 10 – 25 miles per hour, although occasional extreme events reach 40 - 50 miles per hour when the sub-tropical high pressure cell north of the islands intensifies. Damaging Kona winds have reached velocities of 50 miles per hour for several days on end. Kona storms generally come from the south and southwest and move erratically, though with a slow tendency toward the west.

Tropical Cyclones

The other source of damaging winds is a tropical cyclone. They are defined as large circulating windstorms that form over warm tropical ocean water. Tropical cyclones generally occur during the season between June 1 and December 1. Depending on windspeeds, they are categorized as tropical depressions, tropical storms or hurricanes. Hurricanes are the most damaging events on Oahu and result in the greatest annual losses from a natural disaster. To be officially classified as a hurricane, the sustained wind speeds must exceed 74 miles per hour. The average return period of hurricanes of different intensities are given in Table 1.

Table 1. Hurricane Annual Odds of Occurrence by Saffir Simpson Category Incorporating NASA and HHRF Sponsored Research

Hurricane Category	Sustained Wind	3-sec. Peak Gust	Anywhere in Hawaii	Oahu Only
1	74 to 94 mph	82 to 108 mph	1 in 25	1 in 80
2	94 to 110 mph	108 to 130 mph	1 in 50	1 in 320
3 or 4	110 to 155 mph	130 to 191 mph	1 in 75	1 in 400
Any Hurricane	Greater than 74 mph	Greater than 82 mph	1 in 15	1 in 55

Most of the existing residential structures in Hawaii are under-designed for high winds, depending on their construction type and location. Terrain or topographic amplification of wind speed has been a significant additional contributing factor in the past hurricane loss experiences of Hawaii. High waves from hurricanes also present a flooding hazard. High waves from hurricanes most often hit the eastern shores as hurricanes approach the islands from the east, and south- and west-facing shorelines as the storm passes to the south and west. Projected average hurricane losses on Oahu are $216 million per year.

Landslides and Rockfalls

Honolulu combines several of the essential components for landslide and rockfall hazards: steep hillsides, heavy rainfall, and strong pressure for residential development in upland areas. They are dangerous because they occur suddenly and move rapidly by flowing or

avalanching down hillslopes and channels. They generally occur during or immediately after severe rainfall of more than 3 inches in a peak 6-hour period. The State identified a number of highway sites on Oahu that have a high risk of rockfall or landslide, many of which have been mitigated or are soon to be mitigated. Therefore have recently been a number of other mitigation measures funded by various organizations.

Earthquakes

Seismic hazard on Oahu was historically underestimated. In the late 1980's, Oahu was recognized to be in a region of moderate seismic hazard, and building standards were improved in 1990. The most current seismic design code available is the International Building Code (IBC). These provisions incorporate state of the art seismic hazard mapping of Hawaii developed by the U.S. Geological Survey (USGS) and the Hawaii State Earthquake Advisory Committee. The risk is now estimated to account for the third largest amount of annualized financial losses behind hurricane losses. Based on an analysis of Hawaii construction cost data, projected earthquake average annual loss is about $21 million on Oahu.

VOG

VOG describes the volcanic gaseous emissions from Kilauea volcano. VOG occurs when volcanic gases react with sunlight, oxygen and moisture creating a variety of compounds, at varying concentrations, that could have adverse impacts on the downwind communities and environment. While creating hazy conditions on Oahu the elevated SO_2 levels that cause major environmental concerns are expected to dissipate prior to reaching Oahu. Therefore VOG is not currently considered a relatively significant health hazard to Oahu, although the islands of Maui and Hawaii are more severely affected.

Tsunamis

The Hawaiian Islands have a long history of destruction due to tsunamis and are the most vulnerable place in the world, particularly vulnerable to tsunamis originating in the north and the southeast Pacific Ocean. Twenty-six tsunamis with flood elevations greater than 3.3 ft (1 m) have made landfall in the Hawaiian Islands during recorded history, and 10 of these had significant damaging effects on Oahu. This translates into a recurrence interval of one large tsunami reaching Hawaiian shores every 7 years and one damaging tsunami reaching Oahu every 19 years, although there hasn't been a large tsunami since 1975. Annual tsunami losses are estimated at $44 million.

Floods

The major flooding events in Hawaii are caused by storms, storm surge, high surf and tsunamis. In the City & County of Honolulu, from about 1915 to 2000, floods caused by rainstorms, including *tsunamis, and hurricanes* have claimed more than 140 lives and

inflicted more than $200 million dollars of direct and indirect damage. Some of the largest rainfall counts and most severe flooding events have occurred in the last several years, with the Manoa flood in 2004 alone causing an estimated $85 million in damage. Floods are estimated to cause $13 million in damage per year.

Dam Failures

There are three types of dams: detention, storage, and diversion. A majority of Oahu's 21 existing dams were built by private plantation owners in the early 1900's for irrigation and not flood control; there were no standards at that time. Two factors influence the potential severity of a full or partial dam failure: the amount of water impounded, and the density, type, and value of development and infrastructure located downstream. Dam condition assessments and dam failure inundation studies have recently been completed. The two dams posing the greatest hazard due to their downstream population density are the Nuuanu Reservoir dam and Kaneohe Dam.

High Surf

High surf is classified as a condition of very dangerous and damaging waves ranging in height from 10 ft to 20 ft or more. These waves result from open ocean swell generated by storms passing through the north and south Pacific Oceans or from tropical storms and hurricanes. The hazards associated with high waves include debris overwash, flooding, erosion, high wave energy and turbulence in the nearshore zone, and strong currents.

Coastal Erosion

The beaches of Hawaii are vital economic, environmental, and cultural resources. A healthy, wide sandy beach provides protection against the effects of storm surge, tsunami flooding, and high surf impacts. Coastal erosion and beach loss are chronic and widespread problems in the Hawaiian Islands. Typical erosion rates in Hawaii are in the range of 15-30 cm/yr. Recent studies on Oahu have shown that nearly 24% or 17 miles of an original 72 miles of sandy shoreline (1940s) has been either significantly narrowed or lost. The cost of the beach loss at Waikiki has been estimated would be about $1 million per year, in order to maintain the beach in its current state. Islandwide annual losses are estimated at $2-3 million.

Drought

Drought hazard considered three sectors impacted by drought: the water supply sector, agriculture and commerce sector, and the environment, public health and safety sector. Drought monitoring, prediction, communication and mitigation is managed through the Hawaii Drought Plan steered by the Hawaii drought council. The integrated water system on Oahu effectively minimizes water supply risks to any particular area on Oahu although continued development in the drier leeward areas will put future pressure on the system. A

relatively small portion of the island is used for agriculture, therefore the commercial sector is not as severely affected by drought as more extensive agricultural counties. Central Oahu has the most vulnerable agricultural areas. The primary environmental safety concern from drought is the wildfire hazard which is exacerbated during drought conditions, particular at the urban wildland interfaces in the Mililani/Waipio areas.

Wildfire

The wildfire risk is increasing as development encroaches on wildlands without sufficient defensible space at the wildland/urban interface. To date property damage on Oahu due to wildfires is minimal although many acres of wildlands have been burnt in recent years. The Honolulu Fire Department is responsible for mitigation and control of urban fires while the DNLR, Division of Forestry and Wildlife is responsible for forest reserves, with a co-response in intermediate area.

Hazardous Materials

A major Superfund Amendments and Reauthorization Act (SARA) provision is Title III, also referred to as Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA established guidelines for Federal, State and local governments, and industry regarding emergency planning and providing communities with information on hazardous chemicals within their jurisdiction. The Hawaii Emergency Planning and Community Right-to-Know Act became law in 1993 (HRS 128E). A Hawaii State Emergency Response Commission (HSERC) was formed and Local Emergency Planning Committee (LEPC) was established in each county. Functions of the LEPC include preparing a hazardous material emergency response plan, reviewing the plan annually, evaluating resources to mitigate an emergency, receiving emergency response notifications, and receiving and processing requests for information from the general public.

Shelters

A list of shelters on Oahu for all hazards is provided in Chapter 17. Hurricanes are the hazard with the greatest need for sheltering. There is an estimated capacity of 291,000 shelter spaces at the designated shelters, excluding the Hawaii Convention Center, Neil Blaisdell Center and Brigham Young University. This could meet the projected needs for sheltering during a "strong" storm. However, a structural assessment of 29 of the designated sheltered indicated that a number of the shelters are expected to be structurally deficient. Further all-hazard shelter evaluations, along with private sector shelter screening are proposed.

Risk Assessment

This is the process or method for evaluating risk associated with a specific hazard. Here, risk is defined as the potential losses associated with a hazard, defined in terms of expected annual loss, resulting from the probability of occurrence, magnitude and severity, asset exposure and vulnerability, and consequences.

Losses linked directly to a hazard event include all damages, deaths and injuries, loss of habitation, and employment losses due to the closure of damaged facilities. This includes physical destruction of buildings, transportation and utility systems, crops, and natural resources and employment losses due directly to the closure of damaged facilities.

Average Annualized Loss (AAL) is an objective measure of future losses averaged on an annual basis, calculated as the sum of the expected loss for each event (i.e., sum of the products of the estimated loss from each event and that event's rate of occurrence). In cases where there is insufficient confidence in the probability estimates of rare events and where sufficient past data is available, the average annualized loss is based on historical losses. This information is used in assessing the relative contributors to total natural hazard losses and determining the priorities for hazard mitigation measures. The comparative average annual losses for the most severe hazards are listed in Table 2.

Table 2. Relative Hazard Severity to the City & County of Honolulu Based on Average Annual Loss Estimates

Hurricane	**$216 Million / Year**
Tsunami	**$44 Million / Year**
Earthquake	**$21 Million / Year**
Flood	**$13 Million / Year**
Debris Flow and Rockfall	**$1 to $5 Million / Year**
Coastal Erosion	**$2 to $3 Million / Year**

Proposed Mitigation Projects

A summary of the proposed mitigation projects is as follows:

- Develop mitigation policies for the general plan and development plans
- Develop policy for buffer zones for high-hazard rockfall areas.

- Update construction standards for utility lifelines.
- Further upgrade electrical transmission and distribution design standards.

- Evaluate and retrofit high risk essential facilities.

- Periodic adoption of the latest International Building Code and related codes.
- Testing of seismic and wind performance of single wall houses.
- Develop certification project for residential safe rooms.
- Provide incentives to homeowners and businesses to retrofit deficient structures.

- Assemble a more accurate building inventory database for risk analysis.
- Provide screening and evaluation of private buildings for sheltering.
- Provide all-hazards assessment of designated hurricane shelters.

- Delineate potential liquefaction hazard areas on Oahu
- Update bridge inventory database and risk assessment modeling.

- Update tsunami evacuation maps.
- Produce 100 year and 500 year tsunami inundation maps.
- Adopt tsunami design provisions.

- Evaluate changes to DFIRM maps
- Develop Rainfall and streamflow gauging system.
- Develop dam evacuation maps.
- Develop policies for repetitive loss properties.
- Investigate feasibility of participation in Community Rating System.
- Maintain fire breaks.
- Purchase equipment for Waianae mountain fuel reduction.
- Provide water storage for Waianae watershed fire protection.

- Develop policy that creates buffer zones for new development along the coastline to account for coastal erosion.

Plan Maintenance and Implementation

The Oahu Hazard Mitigation Planning Committee will meet periodically to monitor the mitigation projects and plan future mitigation directions. Implementation of mitigation actions (whether or not FEMA funded) through planning integrated within existing city programs is considered a key to long-term success. City departments with public facility responsibilities are the initiators of capital improvement and repair and maintenance projects at the City level. The Oahu Hazard Mitigation Planning Committee can therefore function as a communication link and discussion forum for responsive planning and to recognize opportunities for mitigation projects that may acquire FEMA support, and thereby quicken solutions to facility site and building issues. The plan will also be used in updates of the regional development plans and provide direction on future development policy.

CITY COUNCIL
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII
CERTIFICATE

RESOLUTION 11-347, CD1

Introduced: 11/29/11 By: ERNEST MARTIN (BR)

Committee: SAFETY, ECONOMIC DEVELOPMENT AND GOVERNMENT AFFAIRS

Title: RESOLUTION PROVIDING FOR THE APPROVAL OF THE MULTI-HAZARD PRE-DISASTER MITIGATION PLAN FOR THE CITY AND COUNTY OF HONOLULU UNDER THE PROVISIONS OF THE ROBERT T. STAFFORD DISASTER RELIEF AND EMERGENCY ASSISTANCE ACT, AS AMENDED BY THE DISASTER MITIGATION ACT OF 2000.

Links: RES11-347
RES11-347, CD1
CR-3 (2012)

Voting Legend: Y= Aye, Y* = Aye w/Reservations, N = No, A = Absent, ABN = Abstain

SAFETY, ECONOMIC DEVELOPMENT AND GOVERNMENT AFFAIRS	01/10/12	CR-3(12) – RESOLUTION REPORTED OUT OF COMMITTEE FOR ADOPTION AS AMENDED IN CD1 FORM.
COUNCIL	01/25/12	CR-3(12) AND RESOLUTION 11-347, CD1 WERE ADOPTED.

ANDERSON	Y	BERG	Y	CACHOLA	Y	CHANG	Y	GABBARD	Y
GARCIA	A	HARIMOTO	Y	KOBAYASHI	A	MARTIN	Y		

I hereby certify that the above is a true record of action by the Council of the City and County of Honolulu on this RESOLUTION.

Bernice K. N. Mau
BERNICE K. N. MAU, CITY CLERK

ERNEST Y. MARTIN, CHAIR AND PRESIDING OFFICER